National Institute of Environmental Health Sciences

Pilot-study on GIS-based risk modelling of a climate warming induced tertian malaria outbreak in Lower Saxony (Germany)

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Abstract:

The area under investigation, Lower Saxony (Northwest Germany), is a former malaria region with highest incidences along the coastal zones. Malaria had finally become extinct in the early 1950s. Subsequently, further scientific investigations in that field declined. Nevertheless, the vector in shape of Anopheles mosquitoes has still been present in Lower Saxony. Thus, the question arises, whether a new autochthon transmission could take place if the pathogen is introduced again and could develop in Anopheles mosquitoes. Answering this question was the first aim of the investigation at hand. The second one was to examine the spatial and temporal structure of potential transmissions in respect to the predicted increase of air temperatures according to the IPCC scenarios. To answer these questions, current information about Anophelinae and their distribution and habitat preferences within Germany were collected by literature research as well as temperature measurements and Anopheles findings were compiled from the German Weather Survey and the Niedersachsisches Landesamt fur Okologie (NLO), respectively. The results reveal a climate warming between the 30-years period from 1961 to 1990 and the years between 1985 and 2004. Induced by higher monthly mean temperatures, the risk of a malaria tertiana transmission is consequently increasing for Lower Saxony as temperature is the determining variable of the mathematical model. The study could demonstrate that most parts of the country are located within a 2 months lasting transmission zone. Although Germany is not an endemic malaria zone, the pathogen can enter the country most likely by infected people or imported mosquitoes that transport it in their guts.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: IPCC 2001

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Ocean/Coastal

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Germany

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content